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Q.A. TESTING
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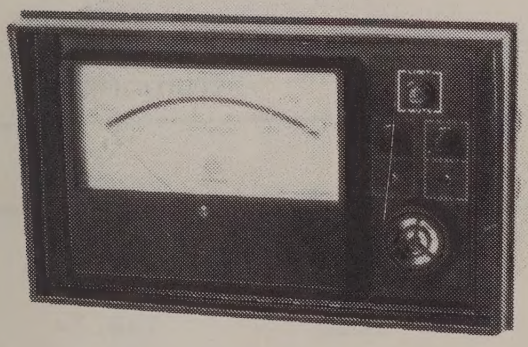

INSTRUCTION MANUAL

Productsaver Over/Under Temperature Alarm MODEL 012005

THERMOTRON

THERMOTRON INDUSTRIES, INC.
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G.A. TESTING
ONLY

THERMOTRON

PRODUCT SAVER (TM) TEMPERATURE LIMIT CONTROL AND ALARM SYSTEM MODEL 012005

Thermotron Industries, Inc.
291 Kollen Park Drive
Holland, Michigan 49423 U.S.A.
Phone (616) 392-1492 T.W.X. 810-292-6164

- **Positive open sensor detection for product protection**
- **Visual and audible alarms with contact closures for individual alarm system**
- **Establishes *both* high and low temperature limits**
- **Selectable operating characteristics provide manual or automatic reset**
- **Tamper-resistant set point adjustments for your protection**
- **High electrical noise immunity for heavy industrial applications**
- **Fully solid state for increased reliability**

General Description

The Productsaver(TM) is an indispensable, bi-directional temperature limit alarm system to protect product and process or both from high and low temperatures. It is designed for applications where temperature must be maintained within prescribed limits and where extreme temperature conditions can damage the process or equipment.

Specifications — 012005

Input:
Thermocouples, type T, J, K, R, SB. Not affected by thermocouple resistances of up to 1000 Ohms. Must be specified when ordering.

Range:
Many standard ranges immediately available, optional ranges can be specified.

Measuring/Alarm Accuracy:
± ¼% typical.

Outputs:
Visual — Separate alarm (yellow), 'high limit' (red) and 'low limit' (green) warning lights. **Audible** — Pulsing 2800 Hz, 70 db warning tone. **Contacts** — Separate 'alarm', 'high limit' and 'low limit' SPDT contacts, rated 4A @ 115vac.

Sensor Break Protection:
Special circuit provides full-scale temperature indication, turns on 'alarm' light and turns off 'high' and 'low' limit contacts.

Cold Junction Compensation:
Precision oven type stabilization.

Alarm Set Points:
Screwdriver-adjustable high-resolution (±0.2%) potentiometers. Adjustable from front panel.

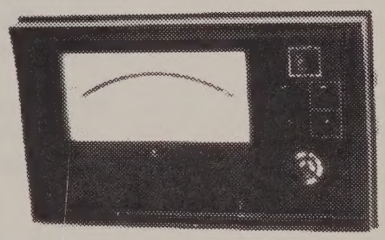
Indication:
6" (15.4cm) meter displays temperature, or set point levels when 'high' or 'low' pushbuttons are depressed at front panel.

Alarm Repeatability:
±0.1%.

Hysteresis:
Less than ±0.05%.

Operable Ambient Range:
+32F to +131F (0C to +55C).

Temperature Effect:
Less than ±0.01%/deg F. (from 77F) (±0.02%/°C) over operating range.



Power Requirements:
117vac 50/60 hz.

Line Voltage Effect:
Less than ±0.03% for ±15% line voltage changes within operating range.

Housing:
Panel mounting aluminum case, suitable for bench service.

Connectors:
Screw type barrier strips.

Dimensions:
5.8" (14.73cm) high, 9.6" (24.38cm) wide and 8.4" (21.34cm) deep. Protrudes 7.2" (18.29cm) behind mounting panels.

Weight:
6.5 lbs (2.95kg).

Form No. PSO-015-R982 Printed in U.S.A.

GENERAL DESCRIPTION:

The Productsaver is a temperature measuring instrument that can be used as an over/under temperature alarm unit and/or back-up temperature controller. A six-inch meter on the front of the unit provides temperature and set point indication. The three push button type indicator lights (on the front panel) have three functions; (1) visual out-of-tolerance alarm indication, (2) alarm reset/mute switches, and (3) meter display control switching. An audible warning device is located just below these lights, and will sound whenever an out-of-tolerance situation occurs.

Terminals for connection of thermocouple sensors and the input power will be found on the back of the unit. Also found on the back are three relays whose contacts are brought out through three separate terminal blocks. These contacts may be used for controller/interlock connections, and to signal remote alarm devices.

INSTALLATION:

The Productsaver may be used as a "portable" device, but is specially designed for panel mounting. Sixteenth-inch thick panels are the recommended minimum. To mount the unit, provide a cut out measuring 9-1/8" wide and 5-1/4" high $\pm$ 1/32". Slide the instrument through this cut out from the front of the panel and secure it from behind using the special mounting clamps provided with it.

POWER SUPPLY WIRING:

Remove the safety cover from the back of the unit, and you will find that the various terminal blocks are clearly identified.

The Productsaver must be supplied with an input power of 115vac, 50/60 Hz, at 10 volt-amps maximum. The input power terminals are identified "L" (line), "N" (neutral), and "E" (earth).

WARNING:

A 115 VAC potential can be harmful or fatal.
Take steps to ensure your tools and body
DO NOT contact these areas.

SENSOR WIRING:

The sensor terminals are color-coded. The instrument uses a thermocouple as its temperature sensor, and the color code of the thermocouple wire must match that of the terminal block. Unless otherwise indicated, a type T (copper vs constantan) thermocouple must be used. If any extension wire is used, be sure that it is thermocouple extension wire having the same color code (Blue for copper/Red for constantan), and observe polarity throughout the wiring. The instrument isn't sensitive to Type T thermocouple resistance up to about 100' of wire.

DETECTOR CIRCUIT:

The calibrated temperature signal should always be inside the range of 0v to +5v. Anything outside these limits is an overrange indication. When this situation occurs, the detector circuit disables the red and green alarm channels.

The usual cause for an overrange indication is a broken or disconnected sensor. The detector circuit is designed to open the red and green contacts in order to disable any heating and cooling equipment until the instrument's sensing function can be restored.

CONTROL CIRCUIT INTERCONNECTION:

The output terminal blocks are color-coded to match the indicator lights on the front of the unit. The yellow contacts operate with the yellow light, etc. The legends at these terminals refer to the relay itself, not to the alarm status of the instrument. The terminals are identified "C' (common), "NO" (normally open) and "NC" (normally closed). When the relays are de-energized (resting state) the "C" and "NC" terminals are contacted. By the same token, when the relays are energized, the "C" and "NO" terminals are contacted. By wiring a circuit through the "C" and "NO" contacts you will provide not only out-of-tolerance protection but also protection in the event of power interruptions.

OPERATION (and limit adjustment):

In normal operation the Productsaver's meter reads the measured temperature. When the red indicator button is depressed, the meter will display the high limit setting. When the green indicator button is depressed, it displays the low limit setting. The limit adjustments are located just below

these two indicators (through the two access holes) and are color-keyed to match the indicators. To adjust these limits, depress the associated indicator and turn the adjustment as necessary to provide the desired reading on the meter.

Whenever a high or low limit is exceeded, the red or green (respectively) indicator will light up. The yellow indicator will flash on and off, and the audible warning device will pulse. Push the yellow indicator button to mute the audible warning. If the unit has been set for automatic reset, the red or green alarms will automatically go off when the temperature returns to within the limits. If the unit has been set for manual reset, the alarms latch and must be manually turned off after the temperature returns to within the limits. This is done by pushing the red or green indicator (whichever one is on). The relays on the back of the unit always operate in reverse with respect to their associated indicator light. (light on = relay off, and vice versa)

RESET OPERATION:

Automatic or manual reset operation may be selected by means of the two small jumpers, (S4 and S5) on the left end of the main circuit board inside the unit (see diagram, page 8). Position 1* provides automatic reset. Position 2 enables a circuit which puts the Productsaver in automatic reset the instant power is applied and holds it that way for 10 seconds. If the temperature does not come within limits during this time limit, the Productsaver must be manually reset. Position 3 provides manual reset with alarms at start-up. The upper jumper (S4) is for the high limit, and the lower jumper (S5) is for the low limit. The jumpers are independent from each other, and it is not necessary to select the same reset operation mode for the high limit as has been selected for the low limit, and vice versa.

RESET JUMPER (S4, S5) SETTINGS

Set Jumper at:	To Provide:	Corresponding Jumper Position
1	Automatic Reset	
2	Manual Reset/Automatic Start up	
3	Manual Reset/Power Failure Detection	

* Position 1 is used when the Productsaver is to be used as a controller.

ADJUSTMENT & CALIBRATION (Continued)

The Productsaver has a number of adjustments which should be checked, and reset (if necessary) periodically in order to assure accurate operation. This should be done following installation, and about once every six months. The following tools are necessary to calibrate the Productsaver:

Small (No. 1 or No. 2) screwdriver
Digital Voltmeter (at least 3.5 digits)
Portable Thermocouple Potentiometer (or Millivolt source)
16 Pin Dip clip
*Variac
*Oscilloscope

Alignment and Test procedure:

1. Hook-up 110 V.A.C. from Variac and Thermocouple inputs from the portable potentiometer.

2. Set S4 and S5 to position 1.

3. Set power supply voltages (Power supply board).
   a) Connect (–) DVM lead to pin 4 of IC 20.
   b) Connect (+) DVM lead to test point D
   c) Adjust R57 so DVM reads -15V exactly
   d) Connect (+) DVM lead to test point F
   e) Adjust R55 so DVM reads +15V exactly
   f) Connect (+) DVM lead to test point G
   g) Adjust R52 so DVM reads +5V exactly.

*4. Check line regulation
   a) Connect (+) DVM lead to test point F
   b) Adjust Variac for line voltages between 95 volts and 130 volts.
   c) DVM should remain within ± 0.02 VDC

*5. Check power supply for noise.
   a) Ground oscilloscope to pin 4 of IC 20.
   b) Connect (+) oscilloscope lead to test points D, F, and G
   c) Noise reading below 30 millivolts is acceptable

6. Check reference junction (main circuit board)
   a) Connect (–) DVM lead to anode (unbanded) side of diode 6
   b) Place (+) DVM lead at junction between R1 and R2
   c) Should read +7.50 VDC approximately
   d) Place (+) DVM lead at IC1-3
   e) Should read +7.50 VDC approximately
   f) Place (+) DVM lead at the cathode (banded) end of diode 1
   g) The DVM should register variable pulsing

**omit for field calibration*

**7. Check low range.
   a) Set portable potentiometer to -125°F (-87.6°C)
   b) Connect (+) DVM lead to IC6-3
   c) Adjust R13 to approximately +1 to +2 mv(green light must be ON)
   d) Adjust mechanical zero on the meter to -125°F (-87.6°C)

**8. Check high range.
   a) Set portable potentiometer to +375°F (+190°C)
   b) Adjust R19 to +5.00 VDC

**9. Span Meter.
   Adjust R26 to +375°F (+190°C) on meter

**10. Check midrange
   a) Set portable potentiometer to +160°F (+71°C)
   b) DVM should read +2.52 VDC ± .02 VDC
   c) Meter should read +160°F ± 2°F

11. Check open thermocouple condition.
   a) Open EMF switch on portable
   b) Meter must peg upscale
   c) DVM must read approximately +13 VDC
   d) Yellow light must flash
   e) Horn must beep
   f) Close EMF switch

**12. High set point adjustment
   a) Connect (+) DVM lead to IC8-3
   b) Adjust the high limit adjustment (just below the red light on the front) from 0.0 VDC to +5.00 VDC to ensure proper range
   c) Depress the red light and set the high limit adjustment to +250°F
   d) DVM should read approximately +3.50 VDC

**13. Low set point adjustment.
   a) Connect (+) DVM lead to IC9-2
   b) Adjust the low limit adjustment (just below the green light on the front) from 0.00 VDC to +5.00 VDC to ensure proper range
   c) Depress green light and set the low limit adjustment to +50°F

14. Check alarm limit switching
   a) SLOWLY adjust portable to cross each set point
   b) The respective alarm should light
   c) Depress the appropriate light. No movement of the needle indicates clean switching

**These adjustments are made for the standard range Productsaver (-125°F to +375°F). Optional ranges require substituting the respective temperatures (high, low and mid-range) for the standard temperature indicated.*

d) Adjust portable potentiometer to a point within set point limits

15. Depress both lights simultaneously.

16. Disconnect DVM.

17. Adjust S4 and S5 to position 3.

18. Momentarily turn off power.

19. All lights and horn must be operating when power is returned.

20. Check alarm reset.
    a) Depress the yellow light - alarm should mute
    b) Depress the red light - red light goes out.
    c) Depress the green light - green and yellow lights go out

21. Adjust S4 and S5 to position 2.

22. Momentarily turn off power.

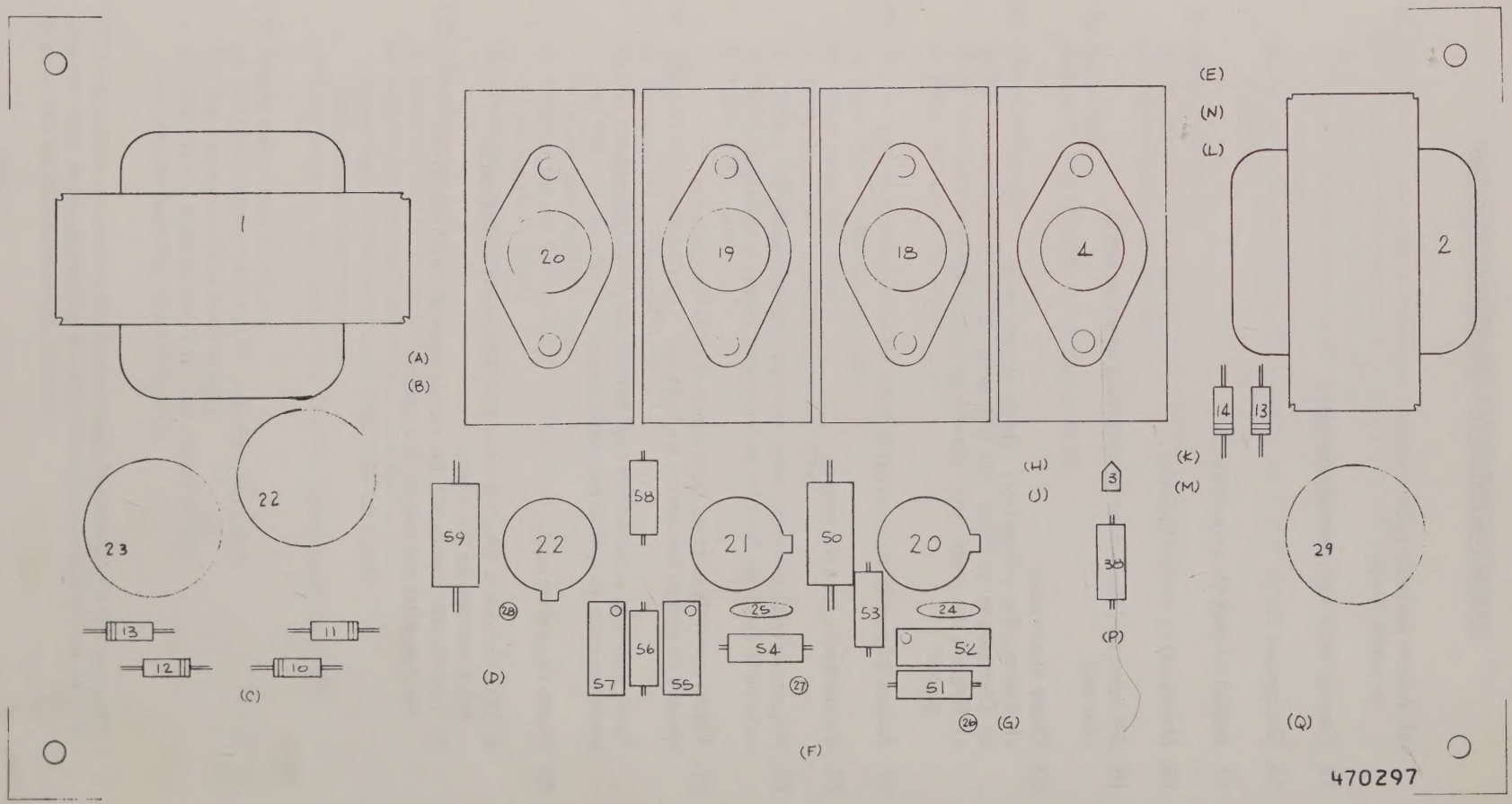
23. Adjust portable potentiometer to cross limits to verify automatic reset for first 10 seconds after power is returned

24. Adjust portable to cross both limits after 10 seconds has elapsed to ensure the alarms are holding.

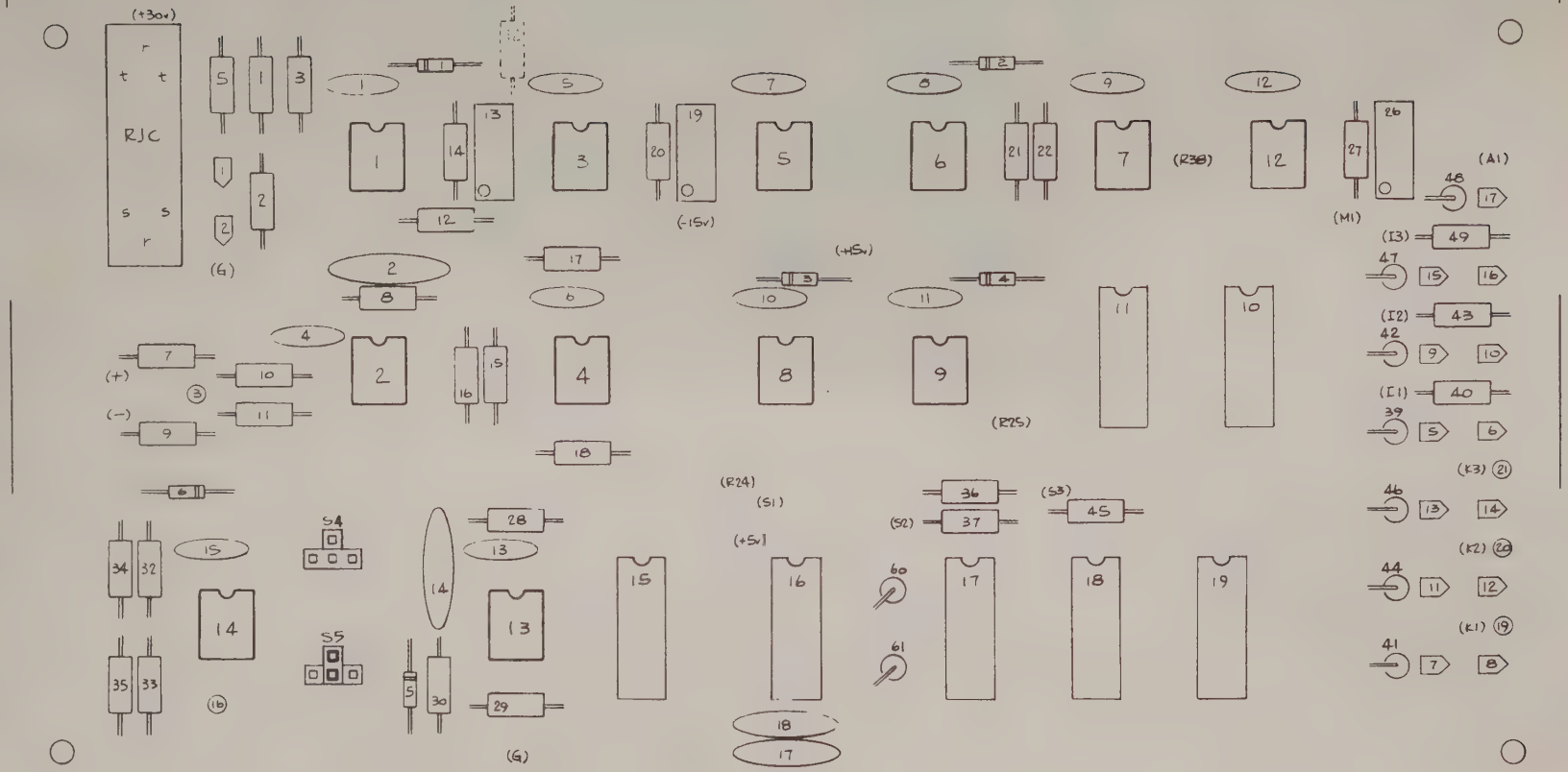
    Reset alarms as indicated in step 19 and return the portable potentiometer to within deviation limits.

25. Check relay continuity.

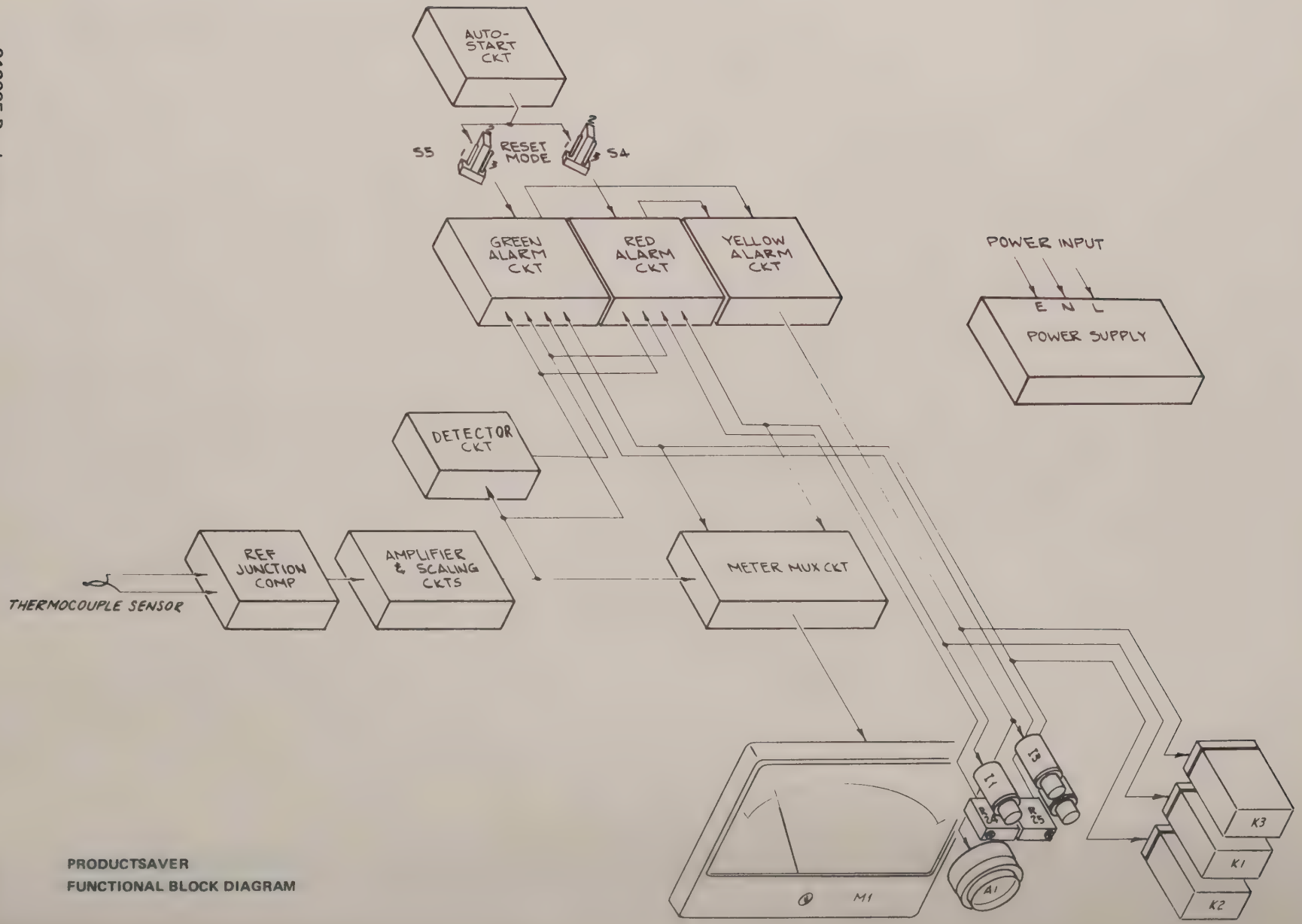
    a) When power is ON, the relay contact should be opposite what appears on the legend
    b) Turn power supply off, the relay contacts should be the same as what appears on the legend



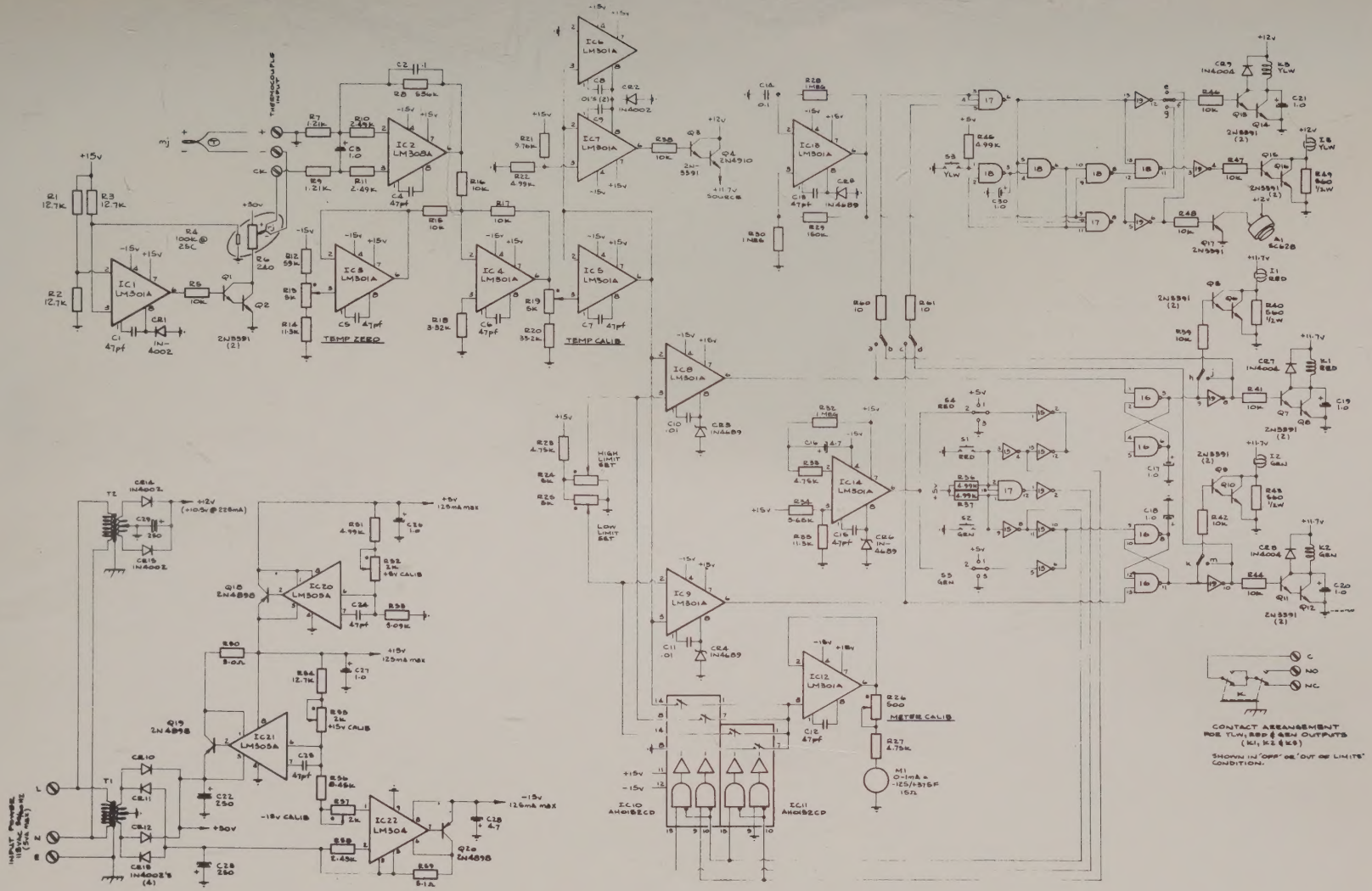
PRODUCTSAVER
COMPONENT AND WIRING LOCATIONS
POWER SUPPLY PCB ASSEMBLY



PRODUCTSAVER
COMPONENT AND WIRING LOCATIONS
MAIN PCB ASSEMBLY



PRODUCTSAVER
FUNCTIONAL BLOCK DIAGRAM


THERMOCOUPLE INPUT
TEMP ZERO
TEMP CALIB
HIGH LIMIT SET
LOW LIMIT SET
METER CALIB
-15V CALIB
CONTACT ARRANGEMENT FOR TLN, RED & GRN OUTPUTS (K1, K2 & K3)
SHOWN IN 'OPP' OR 'OUT OF LIMITS' CONDITION.

PRODUCTSAVER
SCHEMATIC DIAGRAM